DOCUMENT RESUME

ED 206 312 IR 009 624

TITLE CHANNEL 2000. Description and Findings of a Viewdata Test.
INSTITUTION OCLC Online Computer Library Center, Inc., Dublin, Ohio.
PUB DATE Apr 81
NOTE 23p.

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Formative Evaluation; Futures (of Society); Information Seeking; *Information Services; *Library Role; *Online Systems; *Socioeconomic Influences; Technological Advancement; *Telecommunications; User Satisfaction (Information); Use Studies; *Video Equipment
IDENTIFIERS OCLC; Videotext; Viewdata

ABSTRACT

A controlled user test of an experimental viewdata system, Channel 2000, was conducted by OCLC in Columbus, Ohio, to investigate technical, business, market, library, and social issues involved in electronic delivery of information using videotex technology. The three part report includes a review of various facets of new consumer electronic information services, details of the Channel 2000 project, and the findings and conclusions derived from this study of a system that transmits textual and graphic data from a host computer to modified television receivers in the user's households via commercial telephone or cable transmission facilities. Test planning and selection methods, training of users, descriptions of services and specialized features offered, and the equipment (including television adapters, computers, and software) are presented in detail, as are the research procedures concerned with sampling, data collection, and evaluation. Conclusions about viewdata are concerned with its form for the future, its socioeconomic influence, and its impact on libraries. (RAA)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED206312

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

CHANNEL 2000

Description and Findings of a Viewdata Test

Conducted by OCLC in Columbus, Ohio

October-December 1980

Research Department
OCLC Online Computer Library Center, Inc.
Dublin, Ohio 43017
April 1981

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Lois Yoachum

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

IR009624

A test of a viewdata system called CHANNEL 2000 was conducted by OCLC in Columbus, Ohio, during the last quarter of 1980. An outgrowth of the OCLC Research Department's Home Delivery of Library Services Program, CHANNEL 2000 was developed and tested to investigate technical, business, market, and social issues involved in electronic delivery of information using videotex technology.

OCLC (Online Computer Library Center) is a not-for-profit library computer service and research organization based in Dublin, Ohio. The Center operates an international computer network that libraries use to acquire and catalog library materials, order custom-printed catalog cards, arrange interlibrary lending, and maintain location information on library materials.

The OCLC Research Department conducts mission-oriented research in all aspects of library and information science supporting both OCLC requirements and the broader needs of the library and information science community. Through this research, OCLC maintains its commitment to explore, study, and participate in technological advances in library and information science.

Thomas D. Harnish
Project Manager

Introduction

The CHANNEL 2000 Project focused on a type of videotex system called viewdata.

Viewdata systems generally use an internally modified or externally adapted television set to display text and graphics. The public telephone network is used to link the adapted TV set to computers and associated data bases providing a wide variety of information and services. Viewdata services are generally designed for personal use rather than for professional or academic use, and are paid for by the individual user, although business and school applications of viewdata systems are being tested. Relative ease of use and low cost are characteristics of viewdata systems that distinguish them from commercial timesharing or information retrieval services.

Similar but fundamentally different types of videotex systems known as teletext were not tested. With a teletext system, users can only capture a limited amount of information sequentially broadcast by the videotex system. With a viewdata system, users activate a host computer to satisfy their specific information needs.

Information services discussed in this report are referred to as Home Information Services. However, most of the services are also suitable for use in public locations such as airports, convention centers, dormitories, hotels, libraries, and government offices.

The CHANNEL 2000 Project Report is divided into three parts: A review of various facets of new consumer electronic information services, details of the CHANNEL 2000 videotex project, and findings and conclusions derived from the project.

Viewdata: An Evolving New Medium

Originally intended as simply another way of generating revenues from telephone systems, viewdata is evolving into a new means of distributing information. Ironically, developments suggest that extensive changes will be required if the public-switched telephone networks are to adequately meet technical requirements and consumer demand. Cable is becoming an attractive alternative as the number of homes with access to cable increases. Numerous systems have developed around the world.

Factors Supporting Development

Large-scale integrated circuits have been an impetus for viewdata. Low-cost high-speed components can now make electronic information available to consumers through systems that once were available only to technicians, scientists, and business people.

Economic factors have also had an impact. Inflation has increased labor costs and emphasized reduction of delivery costs. At the same time, an increasing number of two-paycheck families have more disposable income but less discretionary time.

Social change from a work ethic to a leisure ethic has led to a focus on self and increasing consumer demand for convenience. Future changes from an industrial economy to a service economy and from mass production to individualized production will create a favorable environment for new home information and entertainment services, in general, and viewdata in particular.

Selected Viewdata Experiments

Name	Company	Location	Users
BILDSCHIRMTEXT	Deutsche Bundespost	Germany	6000
CAPTAINS	PTT*	Japan	1000
CHANNEL 2000	OCLC	Columbus, OH	200
GREEN THUMB	United States Department of Agriculture	Kentucky	200
PRESTEL	PTT*	British Isles	8000
PROJECT IDA	Manitoba Telephone Systems	Canada	100
PROJECT PRONTO	Chemical Bank	New York City	200
TELEDATA	PTT*	Denmark	200
VIDITEL	PTT*	Netherlands	4000
VIEWTRON	AT&T and Knight-Ridder	Coral Gables, FL	200

*Post Telephone and Telegram: Government agencies supplying communications services.

Viewdata services will allow public access through libraries to electronic information.

Information Seekers

Research into new product/service adoption has consistently shown that early adopters of a new product or service are different from those who adopt the innovation later. Early adopters, for example, have a need for information of all sorts; they seek information in newspapers and magazines, books and newsletters, radio and television, and in libraries. For them, viewdata will provide an "information window" to areas not readily accessed now. Through viewdata, the consumer of the 80s will eliminate many of the time-consuming activities associated with information-seeking. In our increasingly information-hungry society, consumer demand for convenience will be met by this new information medium.

Problems of Access

But this new information medium may create a new kind of poverty. Poverty is essentially a lack of options created by lack of financial resources, or a lack of options created by lack of informational resources. Will there be new federally funded programs for the informationally disadvantaged or an information stamp program to help maintain parity between the affluent informed early adopter and the rest of the population who have less convenient access to information?

Role of Libraries

Libraries will play an increasingly dynamic role in meeting consumer demand for information. Libraries, focal points of information collection, organization, and dissemination in their communities, are moving toward delivery of services to patrons via electronics and computers. Broadcast and cable television programming, online data base access, personal computers, and even electronic games are currently offered by innovative libraries. Advances in computer and communications technology offer many alternatives for remote electronic delivery of information by libraries.

As consumers search for ways to secure more discretionary time, as a complex environment demands more informed decision-making, and as social change promotes immediate gratification, consumers will use services which best support their changing life-styles.

By meeting these changing needs, libraries can become a community resource in more and different ways than previously envisioned. While library effectiveness may be measured less in terms of patron visits and more in terms of viewdata system access, no overwhelming change in paper-medium-based services is envisioned for the near future.

As other businesses have found important advantages and opportunities offered by computers and telecommunications, libraries, too, are on the crest of a ground swell of technology that will help reduce costs and increase the availability of library resources. Cable- or telephone-based viewdata services will allow public access through libraries to electronic information in much the same way as books, magazines, and other materials provide access to traditional sources of information. Whether libraries will face insurmountable competition from the commercial information industry or assume a new vital role as community information provider to local viewdata system remains to be seen.

Viewdata can become an important adjunct to traditional library services. It offers greater accessibility, more personalized service, and in so doing may promote a new recognition for the role of libraries.

Search for Solutions

Viewdata ostensibly differs from traditional computerized information systems in its ease of use. Yet, a small percentage of users report they are unable to locate information of interest. At the same time, a larger percentage complain that viewdata is actually too easy to use—simple to the point of inefficiency.

Manufacturers of low-cost TV adapters and special viewdata terminals are attempting to provide attractive and rugged devices with color and pictorial displays requiring sophisticated, costly technology. Innovative approaches to viewdata system design, each with inherent advantages and disadvantages, are being developed independently, with little compatibility.

Determining the essential mix of services necessary for success challenges information providers. Libraries, faced with a new medium for information collection, organization, and dissemination, ponder organizational and financial implications in an environment of change and tight budgets.

Regulation and standardization requirements will certainly impinge on future directions. The outcome of AT&T antitrust litigation and newspaper attempts to stop the Bell System's videotex developments will have a profound effect on the rate and direction of growth of viewdata. That viewdata/teletext decoders built into TV sets will be mandated by FCC regulation in the same way that UHF tuners are required seems unlikely in the near future. Nevertheless, some standardization will be required to permit interoperability of evolving systems and services.

For the near term, more experimentation and development are likely around the world. Viewdata, as a concept, seems very attractive to consumers. But to succeed, it must be a service that meets a need at a reasonable price against competing systems, such as teletext and low-cost timesharing and information retrieval services. Entertainment systems, such as videodisc and videocassette, will also compete for disposable income among consumers in the prime-buyer group.

Promising Future

Viewdata devices that do not use a TV are appearing with costs below $300. Cable company add-on equipment is in the same price range, and various electronic games with videotex capabilities follow the decreasing price trend. Soon, it should be expected, some firms will give away terminals if consumers will buy their viewdata services.

By 1990 people will continue to communicate predominantly by telephone and receive entertainment from television. But electronic information will become a common consumer service available through private or public devices. Industries such as newspapers, broadcasting, merchandising, publishing, and electronics have demonstrated viewdata systems of their own or have made substantial investments to evaluate this rapidly developing technology. Estimates forecast widespread acceptance with more than $2 billion in service revenues generated by over 8 million households in 1985, expanding to $10 billion by 1990. How these services will evolve depends to a great extent on those who become involved today.

Electronic information will become a common consumer service

CHANNEL 2000 PROJECT

Project Initiation

When OCLC was founded in 1967, one of its objectives was delivery of information to users when and where they want it. The OCLC Annual Report for 1968-69 described a development project that would someday provide remote access to computerized library catalogs-this at a time when large-scale remote access to computers was far from commercially feasible. By August 26,1971, OCLC was offering libraries technical services through its own network; at that time commercial timesharing and telecommunications systems were in their infancy. OCLC quickly grew from a regional network to a national one, providing services to libraries in most of the states.

Home Delivery of Library Services

In 1977 OCLC established the Research Department to maintain its commitment to explore, study, and participate in technological advances in the field of library and information science. Since June 1978 the Research Department has conducted a series of investigations as part of the Home Delivery of Library Services Research Program. The program provides a comprehensive structure within which to investigate development of innovative systems offering library patrons (consumers) easy and inexpensive access to information. Research tasks are initiated as an outgrowth of three continuing projects: Technology Evaluation, Service Identification and Market Analysis.

Then, in 1978, as OCLC expanded internationally, Frederick G. Kilgour, Founder and at that time President of OCLC, returned from a business trip to London with a Times article describing a TV-based information system called Viewdata. Investigations were initiated to assess whether the viewdata concept could be integrated into the library setting. Early results of the Home Delivery of Library Services Research Program identified viewdata as a promising technology for libraries and library patrons. Research, syndicated studies, and a host of related development efforts around the world supported this finding. Meanwhile, through contacts and meetings with firms having viewdata interests in the United States, Canada, Japan and Europe, OCLC staff found that:

1. No one seemed to think libraries had much to do with electronic information. ("They dealt just in books.")
2. Viewdata was essentially an easy-to-use timesharing computer service with a large data base.

The conclusion was that if OCLC and libraries wanted to understand viewdata, an in-house system would have to be (and could be) developed.

Proof of Concept Development

A design engineer from the OCLC Computer Facilities Division was assigned to build a prototype viewdata decoder (TV adapter) that could be connected to a standard television set. Concurrently, research staff developed retrieval software and a text editor program for data entry. OCLC Library staff selected materials for an online library catalog, and part of a consumer information catalog published by the U.S. Department of Commerce was edited for electronic use. Once the system became operational, two "enhanced capability" decoders were designed, built, and tested. Technically, an OCLC viewdata system seemed feasible. But operational feasibility could not be determined with prototype decoders and a few hundred screens of data.

Planning

Growing international interest in viewdata, and research and business prudence suggested a test of a more fully developed system that offered extensive information services. OCLC decided to seek outside funding from foundations or firms with an interest in viewdata and the broader field of home information services. Meanwhile, appropriate information services were identified, potential information providers were located and contacted. At the same time, functional specifications were developed, computer and telecommunications support were sought both within OCLC and externally, and staff support requirements were estimated. A 100-household test was planned, and initial system development began.

BANK ONE of Columbus, Ohio interested in demonstrating banking services in the home, approached OCLC regarding their participation as an information provider. Research and financial considerations supported an additional 100 households and offering limited home banking services. An agreement was reached whereby BANK ONE paid incremental costs for OCLC to develop special software for the banking service and in turn BANK ONE was allowed to select 100 participants in OCLC's 200-household test.

Project Objectives

On November 2, 1979, a proposal listing the following goals was submitted to OCLC management for approval:

- Develop and test a library electronic home information system
- Quantify potential user demand for and attitudes toward the system
- Identify additional information services for possible future implementation
- Evaluate the existing environment and potential competition
- Determine the social issues involved
- Examine the role of libraries in the evolving marketplace

A test in Columbus was planned for October, November and December 1980 and system/service development began in February 1980.

CONDUCT OF THE TEST

Selection

Two hundred households were selected for the test. Test participants were selected by two methods. OCLC selected 100 test households using a randomized quota selection procedure. BANK ONE selected 100 test households who were BANK ONE customers, based on the bank's belief that consumer reactions were predictable from other bank tests (such as tests of automated teller machines). Consequently, they chose associates, fellow bankers, bank employees, and senior management from allied firms for promotional reasons.

Training

Four one-hour briefing and training sessions were held (two in the bank's auditorium, two in a branch library activity room). A member of each test household attended one of the sessions and received a decoder with a keypad and associated wiring, an Installation Guide, and a User Manual.

System Use

At home, users attached the CHANNEL 2000 decoders to their own, unmodified television sets (much like attaching an electronic game). They switched the decoder from TV to CHANNEL 2000 and dialed the computer on their phone as instructed by a decoder-generated sign-on screen displayed on the TV. Upon hearing a high-pitched tone, users inserted the telephone handset in the decoder's acoustic-coupler cups. The decoder then automatically logged-on to the OCLC/CHANNEL 2000 host computer.

A "personal user" list of the names of household members, plus "guest" for visitors, was displayed by the computer. A number preceded each name on the list. The user pressed the corresponding number and the action key on the keypad to direct the computer to proceed. Next, the CHANNEL 2000 main index screen appeared.

The main index screen and subsequent index screens listed items, or categories of items, which could be viewed. An item of interest was selected by pressing the corresponding number. Information in the system was located by selecting items from sequential screens arranged in a hierarchical index structure or "menu-tree." A session was terminated by simply returning the phone to its cradle.

Data Collection

Throughout the test, data were collected in three ways. *Transaction logs* were maintained, recording keystrokes of each user during the test, thus allowing future analyses and reconstruction of the test sessions. *Questionnaires* requesting demographic, life-style, opinion leadership, and attitudes toward CHANNEL 2000 were collected from each user in each household before, during, and after the test. Six *focus-group interviews* were held and audio-taped to obtain specific user responses to the information services.

Services Offered

From earlier studies, it was apparent that the viability of a home information system is highly dependent on the services it offers. The user is not overly concerned with technology and equipment, but rather with "What will it do for me?" Except for the bank services, users were offered a collection of information services representative of those which might be offered through a library. Reference information was emphasized (typified by the online encyclopedia) as opposed to ephemeral information such as news, sports, and weather. Almost 2 million index and information screens were available.

The library catalog and encyclopedia data bases were created automatically (that is, by using special OCLC software) from machine-readable records provided by the Public Library of Columbus and Franklin County, Columbus, Ohio, and Arete Publishing Company, Princeton, New Jersey, respectively. Updating of the banking information on the OCLC CHANNEL 2000 computer was accomplished manually by BANK ONE, using OCLC software. Data for other services were entered manually by OCLC staff using text-editing software created by OCLC.

Library Catalog

The CHANNEL 2000 Library Catalog was a computerized version of the Public Library of Columbus and Franklin County (PLCFC) catalog. Data from the OCLC Online Union Catalog were processed along with tapes containing local data to create the "Video Catalog."

Users searched the catalog by author, title, or subject, and had access to any of 300,000 records ("videocards") corresponding to books and other materials held by the main library and its branches. Once the videocard for an item was displayed on the screen, a user could request the item via CHANNEL 2000. The library would respond by mailing the requested item(s) directly to the user's home. The similarity between this service and merchandise ordering from a commercial catalog is important.

Video Encyclopedia

The Video Encyclopedia contained the full text of the Academic American Encyclopedia, a 21-volume work publiched by Arete, The 32,000 articles varied in length from a single screen to over 300 screens of text (illustrations or graphics had to be omitted). Three separate indexes were provided.

1. An Alphabetical list of article titles
2. A topic-subtopic hierarchy
3. An encyclopedia index citing occurrences of all subjects, keywords, names, places and references.

Public Information

The Public Information Service contained information about employment, environment, human services, parks, public utilities, sports, taxes and voting eligibility in the Columbus/Franklin Sounty area. This information was compiled by Com-tility, a local volunteer group acting as an unbrella information provider, drawing information from city, state and private sources.

Community Calendar

The Community Calendar, compiled by the Columbus Regional Information Service (CRIS) of the Columbus Chamber of Commerce, provided a calendar of local education and entertainment events; and a guide to ponts of interest in Columbus. Ticket prices, times and locations were provided.

Math That Counts

Math That Counts was one of two educational services developed by the College of Education (Early and Middle Childhood Education Department) at The Ohio State University. This service provided a variety of exercises for teaching children vasic mathematics. Problem sets were grouped by grade level (kindergarten through sixth grade).

Early Reader

The Early Reader was the second educational service developed by OSU for inclusion in the test. The service, designed to help parents teach preschool children to read and to recognize word relationships, featured 14 single-screen rhymes, as well as instructions to parents on their use.

Home Banking

The Home Banking Service, developed by OCLC for BANK ONE, permitted users to perform a variety of financial transactions involving their own BANK ONE accounts. Users of the Home Banking Service could:

1. View their checking and savings account balances and transaction lists for the current or previous month
2. View current interest rates
3. Pay bills

A three-level security scheme designed by OCLC ensured privacy of personal financial information.

Special Features

To make the system easy to use, OCLC designed several special features into the system. Bookmark, electronic messages, browsing, and help screens were provided by CHANNEL 2000.

Bookmark

A user occasionally needed to terminate a session with CHANNEL 2000 before all desired information had been located. For example, studying a detailed encyclopedia article might be interrupted because someone wished to make a telephone call. The bookmark feature simplified the process of returning to the particular article when the session was resumed. The main index screen offered Bookmark; upon selecting this item, the user was returned to the screen being viewed at the end of the previous session.

Electronic Messages

Future viewdata systems may offer electronic mail (user-to-user), thus providing communication services as well as information services. A limited version of such a mail facility was implemented on CHANNEL 2000. Mail could be sent by the OCLC research staff to any or all participants to announce new system features and periods of system unavailability due to maintenance. The Library)PLCFC) and OCLC used this system to send messages about book orders and banking. Messages directed to a particular user were displayed when the user signed on to the system, prior to display of the main index. Messages could be addressed to individual users, households, groups of hoseholds, or to the entire system. No user-to-user communication was supported.

Browsing

Unlike newspapers and other similar printed matter, which can be scanned quickly, viewdata seems best suited to applications where the user knows exactly what is sought, and knows how to characterize or classify the desired information. Browsing, which is quite common in libraries, is not easily supported by a system designed to provide information on descriptive demand. To simulate browsing capability, a limited scanning feature was incorporated into the CHANNEL 2000 system. The user was able, for example, to move from one encyclopedia article to the next (or any number of articles forward or back) without re-entering the encyclopedia index. Similarly, although a user may have sought a particular book, say, by title, once the book was located, other books by the same author could be viewed directly. This capability for scanning data screens was provided for all CHANNEL 2000 services.

Help

A means for assisting the user in conducting a CHANNEL 2000 session was considered important. In addition to the printed User Manual and a summary of available sunctions and commands printed on the back of the keypad, OCLC supplied on line help capability. When a user keyed in a request for help, a list of possible actions which could be taken at that time was displayed. Upon receipt of a help request, the system displayed the appropriate help screen(s). Return to the screen where help had been requested required only a simple keying sequence.

User Equipment

To be nonintrusive and compatible with existing life-styles, a home information should, when possible, include equipment already found in the homes of potential users. This approach reduces the hardware expenditures required of the user (and/or system operator). The CHANNEL 2000 test required that the user possess a television set and a telephone meeting certain minimum specifications. The only additional pieces of equipment required were the CHANNEL 2000 decoder and associated wiring used to connect the telephone and the TV set. The resulting combination formed a home terminal suitable for the exchange of data with a remote computer. A User Manual and Installation Guide were provided.

Television Set

The CHANNEL 2000 system was expressly designed to utilize any color or black-and-white television received. No modifications to the TV were required. A television signal was generated by the decoder and transmitted via a connecting cable to the VHF antenna terminals of the TV set, tuned to CHANNEL 2, to display the generated image. Normal TV operation was maintained by connecting the user's TV antenna (or CATV feed) to the decoder, where a switching arrangement connected the antenna directly to the TV set when the decoder was not in use (decoder power switch in the OFF or TV position). The external signal source (antenna or CATV feed) was disconnected by the decoder's internal switching arrangement when the decoder was in use (decoder switch in the ON or CHANNEL 2000 position). All CHANNEL 2000 screen images originated within the decoder under control of the host computer and not with a local interactive cable television service, as many observers (and even some users) erroneously inferred.

Telephone

Communications between the decoder and the CHANNEL 2000 computer were conducted over ordinary telephone lines, using industry-standard tone-encoding techniques. Transmission in each direction was at a rate of 30 characters per second. An acoustic coupler arrangement was considered to be the least costly. After dialing the appropriate telephone number (using a standard dial or TouchTone™ telephone), the user placed the handset into two soft rubber cups on the decoder. The cups were spaced and shaped to accept a standard telephone handset (precluding use of Princess™, TrimLine™, or other kinds of telephones). A consequence of using the telephone for communications was that the phone was busy during a CHANNEL 2000 session. People trying to call the household would, of course, receive a busy signal just as they would if the telephone were being used in the conventional manner.

Decoder

The decoder, consisting of a main chassis and an attached handheld keypad, was manufactured by Microcomputer Ventures, Inc. of Columbus, Ohio to functional specifications provided by OCLC. Although the decoder was an experimental device, an attempt was made to make it aesthetically compatible with the other furnishings. Each decoder contained a microcomputer for relaying user input from the keypad to the CHANNEL 2000 computer, and for displaying the resulting output on the TV screen. Although a limited graphics capability was built into the decoder, virtually all of the available screens contained only textual material, presented as white characters on a green or red background. The 16-key keypad, designed for easy holding and use and connected to the decoder through a 25-ft cable, permitted the user to interact with the system from a customary TV viewing position. A summary of available commands and keystroke sequences was printed on the back of the keypad.

Documentation

An *Installation Guide* and a comprehensive *User Manual* were included with each decoder. The four-page *Installation Guide,* profusely illustrated with photographs, directed the user step by step through the process of connecting the decoder to the TV set. Several possible TV system configurations were covered (rabbit ears, CATV connection, VCR, video games, etc.) to ensure that each user could make the appropriate connections unassisted.

The *User Manual* provided detailed descriptions of all CHANNEL 2000 services and features, with representative examples of interactions. It also contained background information on OCLC and the various information providers participating in the test.

Host Computer

All CHANNEL 2000 computer operations were conducted through a dedicated system whose nucleus was a Xerox/Honeywell Sigma 7 central processing unit. This system included 512 kilobytes of main memory, 1.3 gigabytes of storage on 18 moving-head magnetic disk drives, and 56 telephone lines operating at 30 characters per second. Fifty of the lines were available for user access to CHANNEL 2000 services. The remaining six were reserved for staff use. Also supporting the system were a fixed-head magnetic disk, two 1600 bytes-per-inch magnetic tape drives, a high-speed line printer, and a teletypewriter.

The operating system controlling all operations was Xerox/Honeywell's Control Program-Five (CP-V). CHANNEL 2000 functioned as a normal timeshared program, making use of standard CP-V facilities for telecommunications and security.

Software

CHANNEL 2000 displayed requested information by means of two complementary computer programs—one in the Sigma 7 computer and one in the decoder.

Host Software

The Sigma 7 program, when started by the decoder program, checked the identification of the decoder and set up the appropriate telecommunications protocol for that device. It was then ready to interpret requests and do what was necessary to satisfy them. This program would transfer, from magnetic disk storage to the main memory, the information for each screen requested, then compose the screen and transmit it to the decoder.

Decoder Firmware

The decoder program performed several functions. First, when the decoder was turned on, it displayed a screen telling the user how to contact the main computer. Then it had to recognize when the telephone connection was made, and log-on to the Sigma 7 to start the CHANNEL 2000 program. From then on, the decoder program would display any information received from the CHANNEL 2000 computer. It would recognize, encode, and transmit to the computer any keystroke from the keypad. At the same time, this program was always looking for evidence that it had been disconnected. When the user hung up or was disconnected, the program would display a message screen to inform the user.

Command Language and Keypad

The command language(or the set of key sequences designed for requesting services) struck a compromise between ease of use and cost, A keypad with more keys probably would have been easier to use by some. A full alphanumeric keyboard would allow direct access to information by keywords and flexible phrasing of requests. Along with these benefits, though, a full keyboard would have brought the potential confusion of a more complex language and the concomitant requirement of more sophisticated (and costly) software to support it. In addition, the keyboard itself would have been more expensive. A keypad similar to the CHANNEL 2000 keypad but with 24 to 30 keys would have allowed more satisfactory labeling of the keys, making them easier to use. Such a keypad would have to have been custom-made, thus increasing its cost. Keypads with only16 keys are stock items, available in quantity at low cost. Less expensive 12 key pads are also readily available, but they have only two nondigit keys, dictating either a very restricted or a very cryptic, hard-to-use "language". The 16-key pad permitted labeling six keys with words to make each request-there were 18 types of requests-a short English-like statement. The OOPS key was provided for cancelling mistakes during key pressing and for requesting help(by pressing OOPS twice.) The DO IT key was used to conclude each request. The remaining keys-digits 0-9 and the four keys GET, JUMP, FWD, and BACK- were used in combinations to specify different ways of going from one screen to another. The most important way of getting a new screen was to select an item on an index screen by keying the number of the item(followed always by DO IT). One could also return to an index by keying JUMP (followed by DO IT). or, to go to the first screen of a major section of the CHANNEL 2000 information, one could refer to a printed list of the sections and their identifying numbers provided in the User Manual. Then, if the number listed were 9 (for example), the request GET 9 would immediately display the desired screen. To undo such a request(and also to return to normal activity after getting help) one would key GET BACK. To see items that were adjacent or nearby in an index(that is, in another branch of the index tree), it was not necessary to return to the preceding index. For example, one could browse four items forward or back by keying JUMP FWD 4 or JUMP BACK 4. Simply JUMP FWD or JUMP BACK (without the number) would one item forward or back. Since many items filled more than one screen, the commands FWD and BACK were available to move to the next or the previous screen of an item. FWD 3 or BACK 3 would skip forward or back three screens to an item. The user could skip any number of screens at a time. In addition to going from one screen to another, the user also performed other activities using the keypad. To request a book from the library, GET was keyed when viewing the videocard describing the book. The CHANNEL 2000 system would ask for confirmation of a request. Then the only acceptable answers were YES or NO, labels that were also placed on the FWD and BACK keys. To enter a personal identification number, an account number, or a dollar amount in the banking service, the digits (followed by DO IT) were keyed.

Transaction Log and Problem Detection

Like the decoder program, the Sigma 7 program constantly checked for disconnection and for serious problems. On discovering a serious problem the program would report it to both the user at home and the CHANNEL 2000 operations staff, and then disconnect. Any disconnection, whether intentional or accidental caused the program to store a complete record of the session, in order to permit future research and to provide data for the Bookmark feature.

Security and Confidentiality

During banking operations, the program used extra measures to ensure security and confidentiality. A person's financial screens were released only upon verifications of a personal identification number accepted only from that person's decoder. All financial screens were stored in a secure coded (encrypted) form.

Size

The main program occupied about 90 kilobytes of main memory and was not overlaid. One copy of the procedure could be shared by all concurrent users. Besides this main program, the CHANNEL 2000 system included several other programs, such as the two used by the library and the bank to satisfy transaction requests. Messages could be sent to individuals or groups by means of another program. Still other programs enabled the CHANNEL 2000 operations staff to monitor use of the system and to investigate problems A number of programs were involved in creating and editing the large body of information stored on disk. In all, about 25,000 lines of code were written for CHANNEL 2000.

Research Procedures and Results

The CHANNEL 2000 test offered many unique research opportunities and challenges. Participants had the opportunity to examine and experiment with a viewdata service in their own homes. This educational process allowed them to form attitudes, opinions, and perceptions about viewdata services that were based on actual experience and not on speculation.

Sampling Procedures

Initial telephone contacts were made with a randomly selected group of over 3,000 Columbus residents. Individuals who agreed to cooperate and who had the necessary home equipment were sent a brief preliminary questionnaire designed to measure their innovativeness in the use of electronic products and to assess their demographic status. Based on these two indicators, a randomized quota sample of 100 households was chosen to participate. This sample was selected to ensure an equal distribution of high, medium, and low innovators, as well as a representative grouping of all age, income, education, and family-size categories. In addition, 100 households selected by BANK ONE participated in the test.

Data Collection

Test participants completed three extensive questionnaires. The first questionnaire was administered before the test so that initial reactions to viewdata technology could be obtained. The second questionnaire was administered three weeks after CHANNEL 2000 start-up in an effort to gauge early attitudes toward the system. The third questionnaire, administered after the test, was designed to measure concluding reactions to CHANNEL 2000, price elasticity, and potential demand for other viewdata services.

The three questionnaires included the following generalized variables:

1. Perceptions of the CHANNEL 2000 system along six separate dimensions
2. Product-specific life-style measures
3. Opinion leadership
4. Traditional library and banking use
5. Media use
6. Ease of use and usefulness of all CHANNEL 2000 services
7. Reactions to 26 hypothetical viewdata services
8. Pricing
9. Demographics
10. Several open-ended questions

Actual usage, keystroke by keystroke, of the CHANNEL 2000 system by each respondent over the three-month test was stored as a machine-readable transaction file at OCLC with user consent. Six focus-group interview sessions were held in mid-January 1981.

Evaluation of Results

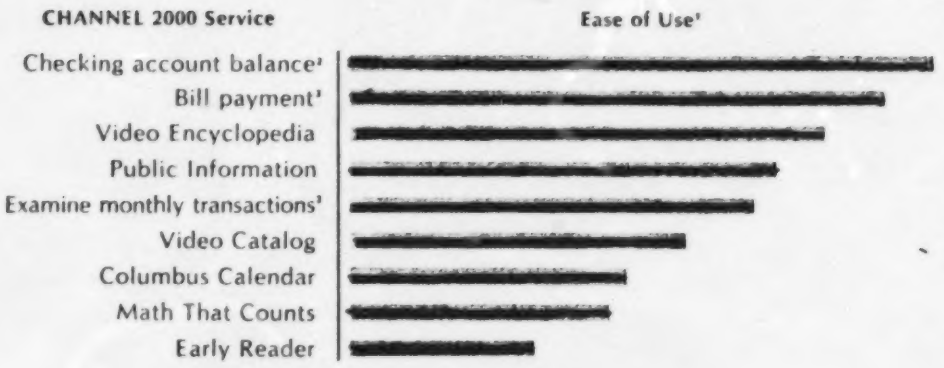
The CHANNEL 2000 system, as tested, represented two primary design considerations: ease of use and low cost. These two factors predetermined the hardware and software configurations of the final CHANNEL 2000 system. The questionnaires, in turn, were designed to reflect upon the wisdom of this approach from a user's point of view.

Ease of Use

Several questions were designed to measure ease of use along two dimensions. One dimension related to how easy it was for users to operate the system. Respondents were asked to rate each of the six CHANNEL 2000 services (plus banking services for those who had this feature) according to a six-point scale, ranging from "very easy to use" to "very difficult to use." Video Encyclopedia, Public Information, and Banking Services were considered to be the easiest to use.

Menu selection, although easy to use was perceived as too slow

Ease-of-Use Mean Scores for CHANNEL 2000 Services



[1]Mean scores based on respondents' evaluations along a six-point scale ranging from 1 (very easy to use) to 6 (very difficult to use)

[2]Banking scores are based on a nonrandom sample of respondents.

Understanding

The second ease-of-use dimension related to how well the users understood CHANNEL 2000 operating procedures. If people understand how to operate a viewdata system, the degree to which they find it easy to use should be heightened. Eighty-five percent of the users either generally or definitely agreed with the statement "I understand how to operate CHANNEL 2000." Only 13 percent of the users felt they needed more instruction on how to use CHANNEL 2000; 18 percent of the users felt that they never did figure out how to use all of the CHANNEL 2000 commands. Fifty-eight percent of the user population felt that they understood the CHANNEL 2000 system well enough to always find what they wanted and only 4 percent reported that they thought they needed a lot of technical know-how to use CHANNEL 2000.

Installation

Eighty-nine percent of the users felt that CHANNEL 2000 was easy to connect. Most people agreed that CHANNEL 2000 did not clutter up their house, but 15 percent of the users felt that it was a problem. Over half the users felt strongly that CHANNEL 2000 should not involve their telephone. Two unexpected findings were that only 11 percent of the users felt that CHANNEL 2000 tied up their television too often (perhaps a result of the multiple TV set household) and only 13 percent of the users reported reading from the television set to be tiring.

Operations

Thirty-five percent of the sample either generally or definitely agreed that there were too many technical problems with CHANNEL 2000. In particular, 42 percent of those users reported that they were occasionally involuntarily disconnected from CHANNEL 2000. This experience certainly had an effect on how people evaluated the CHANNEL 2000 service and suggests that the overall evaluation of the CHANNEL 2000 service might have been even more favorable if these technical problems had not existed. Interestingly, 56 percent of the users who felt that CHANNEL 2000 was a poor system still said they felt the concept was good. Focus-group interviews reflected user recognition that the system was experimental and commercial services would be more reliable.

Consumer satisfaction with the keypad itself seemed to be high as indicated by 67 percent of the users agreeing that the keypad was very easy to use, and 63 percent agreeing that they had no difficulty using the instructions on the back of the CHANNEL 2000 keypad. But the menu-selection indexing method dictated by the simple keypad, although easy to use, was perceived as too slow.

Text display of 30 characters per second on the CHANNEL 2000 system was predicted to be too slow, but only 28 percent of the users indicated that this was the case. However, 34 percent of the users agreed that it took too much time to find a book or locate an encyclopedia article with the system, probably more a reflection on the menu-selection indexing used, than on data transmission rate. Twenty-eight percent of the users stated that it took too much time to complete their electronic banking activities via CHANNEL 2000; this was probably more a reflection on the bank's "back room" manual procedures than on bank system design. Home bill paying was heavily used.

Usefulness

Test participants were also asked how useful they found each of the CHANNEL 2000 services. Responses from users indicated that both the Video Catalog and the Public Information Service were considered to be the most useful CHANNEL 2000 services. Banking Services were next in line, followed by the Video Encyclopedia. Interestingly, Math That Counts received very heavy usage, probably because the service involved several learning games, although it was rated low in usefulness.

Purchase Intent

As a final evaluation measure of the CHANNEL 2000 system, respondents were asked to rank order the seven CHANNEL 2000 services according to the likelihood that they would pay money to have that service in their home. A mean score was calculated for each CHANNEL 2000 service, and the following table shows rank order of preference.

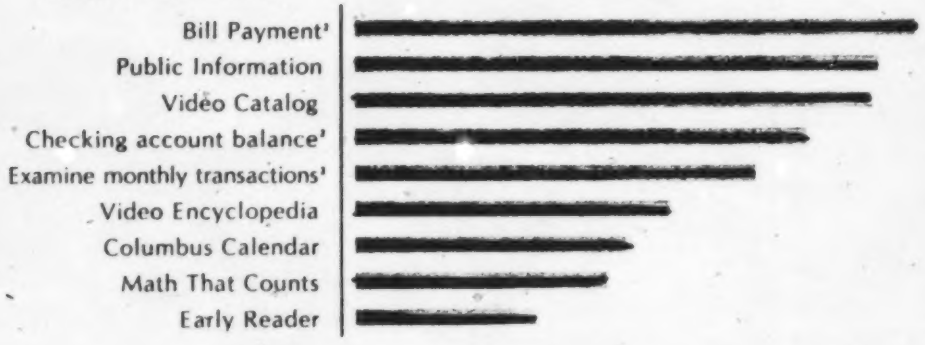
Rank Order	CHANNEL 2000 Service
1	Video Encyclopedia
2	Video Catalog
3	Home Banking
4	Public Information
5	Columbus Calendar
6	Math That Counts
7	Early Reader

Ideal Viewdata Services

One of the valuable aspects of this test was the "educational" process that the CHANNEL 2000 test population experienced. This viewdata learning experience allowed respondents to make informed determinations of the kinds of future viewdata services they might pay for.

To take advantage of this group of consumers' education, each CHANNEL 2000 user was presented a list of

Usefulness Mean Scores for CHANNEL 2000 Services



¹Mean scores based on respondents' evaluations along a six-point scale ranging from 1 (very useful) to 6 (very useless)

²Banking scores are based on a nonrandom sample of respondents

Some respondents said they would pay any price for the convenience.

Cable subscription may be the best predictor of viewdata purchase

Eighty two percent of the respondents felt that public libraries should spend tax dollars on services such as CHANNEL 2000

hypothetical viewdata services. Each user was asked to indicate on a five-point scale ranging from "definitely not" to "definitely would" their willingness to pay $3.00 per month for each viewdata service. Although the cost of $3.00 per month appears to be low for certain viewdata services, subsequent analysis of the data indicated that this value adequately provided a full range of positive and negative scores. The fact remains, however, that certain viewdata services are more of a bargain at $3.00 per month than others, and the reader is cautioned to keep this limitation in mind. The following table lists the top ten services in rank order of preference, as evaluated by the CHANNEL 2000 participants.

Rank Order	Hypothetical Viewdata Service
1	Home security
2	In-home computer
3	Video games
4	Library services
5	Catalog shopping
6	System that contacts doctor
7	Adult self-education
8	Encyclopedia
9	Household energy control
10	Bill payment

Home security is not a viewdata service, but may be provided using the same telecommunications system that delivers viewdata. Transactional capabilities (book ordering, bill paying) which bring "closure" to the information process, were frequently mentioned in the focus-group interviews.

Pricing

Other questions embedded in the three CHANNEL 2000 questionnaires related to prices that consumers would pay for viewdata services. Approximately 17 percent of the users indicated that they would be willing to pay between $10.00 and $15.00 per month for CHANNEL 2000 just as it was in its experimental state. Approximately 80 percent of the users indicated a moderate-to-high purchase probability at $15.00 per month for their six most desired hypothetical viewdata services. Some respondents to questionnaires and participants in focus groups said they would pay any price for the convenience offered by bill paying and book ordering. Naturally, purchase intent may overstate actual purchase behavior.

Target Market

Findings confirmed what was expected from an analysis of consumer characteristics for an innovative electronic information service. People most interested in purchasing viewdata services tend to be young, well educated, and affluent. They seek stimulation through the acquisition of new products and ideas, and tend to participate in a variety of leisure activities. Their active schedules predispose them toward products that can save them time. They are "information hungry" and they are heavy library users. This target group owns the most electronic equipment and includes a high proportion of cable TV subscribers. In fact, cable subscription may be the best predictor of viewdata purchase. Automated teller machines (ATM), credit card use, and catalog shopping were highest in the target segment as well.

Consumer Attitudes

Ninety-six percent of the test population felt the viewdata concept was a good idea, although roughly half were not overly impressed with CHANNEL 2000. Of those users who liked the viewdata concept, 43 percent indicated a high purchase potential for a similar commercial service.

Attitudes Toward Library Services

Forty-six percent of the respondents agreed that CHANNEL 2000 saved their time getting books from the library. Responding to other questions, 29 percent felt that they would rather go to a traditional library than order books through CHANNEL 2000, and 38 percent of the users felt that CHANNEL 2000 had no effect on their library attendance.

Forty-one percent of the CHANNEL 2000 test group felt that their knowledge of library services increased as a result of the CHANNEL 2000 test. In addition, 16 percent of the respondents stated that they spent more time reading books than before the test.

Eighty-two percent of the respondents felt that public libraries should spend tax dollars on services such as CHANNEL 2000. Although this might suggest that library viewdata services should be tax-based, subsequent focus-group interviews indicated that remote use of these services should be paid for by the individual, whereas on-site use should be "free." Sixty-three percent of the test population stated that they would probably subscribe and pay for a viewdata library service, if the services were made available to them off-site.

Behavioral Effects of CHANNEL 2000

Fifteen percent of the users felt that they spent less time watching television programming during the three-month test period. Eight percent of the respondents also indicated that they spent more time talking with their children as a result of having CHANNEL 2000. Statistical confidence cannot be attributed to these finds, although they may be indicative of a positive behavioral effect inherent in viewdata technology.

Conclusions

Viewdata and the Future

The most sought-after answer among viewdata system operators today may be to the question: what is the essential mix of services required to stimulate purchase?

Strong user indications show convenience to be a partial answer. Transaction services (such as catalog shopping and bill paying) will be the foundation of successful viewdata businesses. Entertainment and home security repeatedly test well, but really are not within the definition of viewdata services. That these and other services may ultimately be offered by viewdata service providers seems inevitable, however.

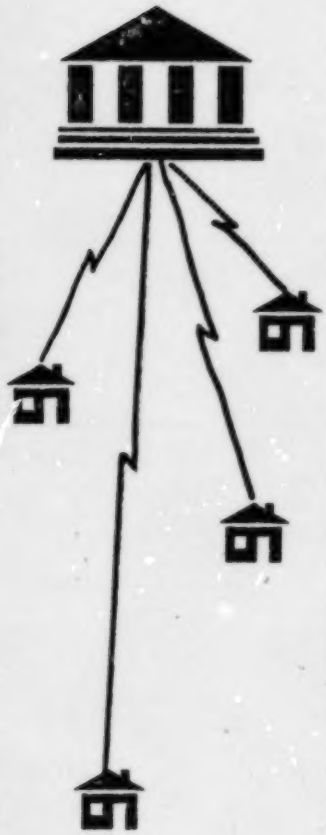
Communications and computers are the underpinnings of viewdata. Without them even the most seductive services are unusable. Consequently, system operator competition will be among the telephone companies, cable operators, and commercial timesharing companies. Competition among information providers will be strongest in areas with the least product differentiation—no great revelation in itself. Viewdata is a medium of broad scope and depth (almost by definition), the market will support a wide variety of information services once 10 to 15 percent penetration is reached.

From an environmental standpoint, regulatory and legal issues will affect diffusion of this innovation. Interoperability of systems will be crucial for the full potential of viewdata to be realized. Copyright, royalty, and privacy/confidentiality issues will be important and difficult to resolve, but probably will not slow system development.

Viewdata and Social Change

Social changes that may be effected by the development of viewdata are major and significant. Social impact will depend on decisions regarding the methods of distribution, pricing (and subsidizing), explicit control of access, and the nature of promotion of the new medium. Social consequences of such decisions therefore bear critical examination.

Social consequences bear critical examination



Styles of use of information may change significantly

Availability of Information
Viewdata can increase the availability of information to the general public, whether the immediate source is a library or some other information provider. This presents opportunities for new approaches to general education for people of all ages. It also suggests an alternative to newspapers for the posting of public notices and other community information. At the same time, viewdata, like many other innovations in communication, will be most useful to people who already have considerable access to information. The methods of information selection, marketing, subsidizing, and pricing will have an influence on how great this differential in usefulness will be. Increasing the information gap could have serious societal consequences.

Rights and Needs of Users
Sources of information (authors, publishers, etc.) and users of transactional services must have control over distribution of their information. Until laws concerning viewdata mature, copyrights and with them the livelihoods of professional producers of some kinds of information may be in jeopardy. For providers of transactional services, there is a dual need: ensuring privacy and security, and convincing the users that their confidence is warranted. Government regulation will eventually fulfill the latter need, by setting standards for the former.

Long-term effects of everyday use of viewdata to satisfy a variety of information needs could not be determined in the timespan of the CHANNEL 2000 experiment. Conceivably, self-education, community awareness, and interpersonal communications at short range (say within the family or at work) will be affected, either positively or negatively, although no clear evidence of such an effect was observed. It seems likely that long-distance communication will be affected by the availability of a full electronic mail facility. Airlines are forecasting a 5 to 6 percent negative impact on travel by 1990. Overall styles of use of information may change significantly in conformity with the strengths and weaknesses of videotex. Such changes could have profound effects on our basic forms of social interaction.

The suggestion that libraries assume a role within this new distribution system has special appeal in light of these considerations.

Viewdata and Libraries

Libraries now stand on the threshold of great opportunities. Emerging electronic technologies provide the potential for a new age of community service in which the library can command new attention and financial support as an information resource serving the survival, growth, and recreational needs of Everyman. Despite their traditional conservative nature, even despite increasingly difficult economic conditions, libraries can achieve a leadership role in meeting individual information needs. Indeed there are those that predict libraries must do so in order to survive. Apocalyptic vision? Hyperbole? Perhaps. But the reality of today's world is change, increasingly rapid change. As its patrons accelerate into the future, libraries must as well. The alternative is irrelevance. And irrelevant institutions disappear.

New Medium
The library, as an institution, was conceived in a simpler time, a time when the records of mankind were printed, physical entities to be transported from place to place, stored in rows on shelves, handed from person to person. It would be foolish to suggest that books and other forms of print-on-paper are doomed to extinction. Books and other materials will continue to serve as archival media for literature and records. However, print will play an ever-diminishing role in the generation and dissemination of "hot" ephemeral information, the continuously changing day-to-day information we rely on to live in our fast-paced society. Just as books and other direct-perception media are eminently suitable for long-term storage, computer systems, with their capabilities for rapid update and communication of information, prove ideal for serving topical, timely information needs.

Libraries have, of course, taken advantage of new technology (particularly computers) to an increasing degree in recent decades. If one looks closely, however, technology has been used to automate, simplify, or streamline existing services, rather than to provide strictly new services made possible by sophisticated machinery. Through

computerized resource sharing, OCLC itself has brought about automation of a great deal of what was formerly tedious and expensive manual work.

New Opportunity

But where is an instance where computers have been used to extend and enhance service to patrons directly? And if few can be found, what is the reason? Certainly one reason is the crucial importance of being able to integrate innovations into the library setting. Could it be that the library has waited for the right system, at the right time? Could viewdata be, in fact, the right technology at the right time?

The importance of viewdata to the library may perhaps be best appreciated by considering the duality of function inherent in contemporary library operation: collection and reference. As used here, "collection" refers to the process of acquiring, organizing, and making available for use the accumulated records of mankind—the traditional library role in society. In the absence of the imminent development of systems permitting electronic delivery of entire book-length texts, one can conclude that the collection function is best served by existing forms (traditionalists take heart!). The book-on-shelf approach is as yet unthreatened in any real sense by developing technologies. True believers in "better living through technology" are best advised to examine the "reference" or information-providing function of the library. And there they find fertile ground for the seeds of change.

New Role

The earliest American public libraries (circa 1880) had no reference function at all as we understand it today. Indeed, the librarian who helped a patron locate a particular item was considered to be performing beyond the call of duty. Gradually, a subgroup—first called "special librarians," and then, "reference librarians"—emerged to satisfy growing public demand.

Over the years, the reference function has in some cases expanded to a point where it is as important as the collection function, which frequently serves in part to support the reference function. Has public perception tracked this broadened role? The answer is yes and no. Yes, the scholar and the frequent patron take advantage of the training and experience of the professional reference librarian, to use and appreciate this information resource. But no, for the citizen at large, in 1981, the library is probably not the information source of choice. The person who needs information may simply never consider the library. And those who do think of the library may not take the time to visit or call.

By bringing the reference function of the library directly into the patron's home, dormitory, or office via viewdata, the "energy barrier" associated with awareness and use of the library is removed. An enhanced viewdata system, perhaps in a hybrid form permitting patron access to extensive data bases, mediated by professional reference specialists, could in effect result in a "distributed library system."

New Relevance

Community-oriented services are difficult for a large national viewdata system to provide. However, they lend themselves to the existing public library form. Public participation in library systems will increase only in proportion to the convenience of such participation. The substitution of communication for transportation provides an increased convenience sufficient to ensure more frequent selection of the library as a choice for satisfaction of information needs. Serious attempts to meet those needs will, in turn, ensure continuing relevance of libraries and their service.

New Beginnings

On behalf of libraries CHANNEL 2000 provided a first step: user attitudes and demands were assessed, additional services were identified, the existing technical and business environments were evaluated, and social issues were considered. The conclusions are positive. Libraries have an opportunity to play a plenary role in evolving viewdata services.

OCLC will continue to explore and assess this new medium and its value for libraries through Viewtel—an exciting new viewdata project under way at OCLC.

The book-on-shelf approach is as yet unthreatened

Libraries have an opportunity to play a plenary role in evolving viewdata services

Information Providers

Frank Greenagel
Academic American Encyclopedia
101 College Road East
Princeton, NJ 08540

John Fisher
Bank One of Columbus
100 East Broad Street
Columbus, OH 43215

Lauri Zofan
Columbus Regional Information Service
Columbus Area Chamber of Commerce
37 North High Street
Columbus, OH 43215

Celianna Taylor
Computer Utility for Public Information
P.O. Box 3244
University Station
Columbus, OH 43210

Marlin Languis
Early and Middle Childhood Education
College of Education
The Ohio State University
Columbus, OH 43210

Richard Sweeney
Public Library of Columbus and Franklin County
28 South Hamilton Road
Columbus, OH 43213